OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports from the captains of 73 vessels navigating the Great Lakes. The following miscellaneous items are extracted from their reports:

Capt. W. S. Hoag, steamship *Barge* **130**, 2d, western Lake Huron, northern lights from 8 p. m. to midnight. 9th, northeastern Lake Michigan, northern lights from 8 to 10.30 p. m.

Capt. George Holdridge, steamship *Barge* **132**, 9th, eastern end of Lake Superior, northern lights from 9.30 p. m. to midnight.

Capt. John Lowe, steamship *Kaliyuga*, 3d, southeastern Lake Superior, northern lights from 11 p. m. to past midnight.

Capt. R. J. Crowley, steamship *Roumania*, 9th, Lake Huron, between Detroit and Presque Isle, northern lights from 10 to 12 p. m.

Capt. F. A. Grans, steamship *Matoa*, 3d, Sault Ste. Marie, northern lights.

Capt. C. Petersen, steamship *Robert L. Fryer*, 4th, Lake Huron, northern lights from midnight to 2 a. m.

Capt. Thomas Hackett, steamship *Volunteer*, 3d, Lake Huron, northern lights.

Capt. Edward Mooney, steamship *Wa-Wa-Tam*, 9th, southern Lake Superior, northern lights from 8 p. m. to 8 a. m., 10th.

Capt. W. P. Robertson, steamship *Petoskey*, 9th, northeastern Lake Michigan, northern lights from 10 p. m. to 2 a. m., 10th.

Capt. R. Jollie, steamship *C. B. Lockwood*, 9th, St. Marys River, northern lights.

Capt. J. W. Morgan, steamship *Australasia*, 9th, Lake Superior, northern lights from 9.15 to 10.30 p. m.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received monthly reports for the month of June from the keepers of 36 U. S. Life-Saving Stations on the Great Lakes.

SUNSHINE AND CLOUDINESS.

GENERAL REMARKS.

The quantity of sunshine, and therefore of heat, received by the atmosphere is a fundamental factor in meteorology; the quantity received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the distribution of cloudiness. The sunshine is now recorded automatically at about 38 regular stations of the Weather Bureau, either by its photographic or its thermal effects. The cloudiness is recorded by personal observations at all stations and is given in the column of "average cloudiness" in Table I.

SUNSHINE.

An instrumental record of sunshine has been kept during the month at 17 stations by means of the photographic sunshine recorder and at 21 stations by means of the thermometric sunshine recorder; the results of these observations are given in Table IV, for each hour of local mean time (not seventy-fifth meridian time). The stations recording the largest percentages of sunshine between the hours of 11 a. m. and 1 p. m. were: Columbus, Ohio, 95; Detroit, 92.5; Little Rock, 94.5; Louisville, 92.5; Memphis, 95.5; St. Louis, 97; Santa Fe, 94. The stations reporting the smallest percentages were: Portland, Oreg., 42; Eastport, 40.

The general average percentage of sunshine for the month is given in the next to the last column of Table IV. The highest percentages were: Tucson, 99; St. Louis, 91; Santa Fe, 88. The lowest percentages were: Eastport, 31; Portland, Oreg., 35.

CLOUDINESS.

The average cloudiness between sunrise and sunset, as based on numerous personal observations, is given for each Weather Bureau station in Table I; the complement of this average cloudiness gives the observer's estimated percentage of clear sky, and these latter numbers are given in the last column of Table IV.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the duration of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of area of clear sky. It should not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observer's personal estimates of percentages of area of clear sky; the average excess for this month is 6 per cent for photographic records and 15 per cent for thermometric records:

Difference between instrumental and personal observations of sunshine.

Photographic stations.	Instrumental.	Personal.	Difference.	Thermometric stations.	Instrumental.	Personal.	Difference.
Tucson, Ariz	99	92	7	St. Louis, Mo	91	73	18
Santa Fe, N. Mex	88	81	7	Little Rock, Ark	80	61	19
Cincinnati, Ohio	79	57	22	Columbus, Ohio	78	56	22
Memphis, Tenn	79	80	— 1	Louisville, Ky	78	56	22
Dodge City, Kans	77	63	14	Colorado Springs, Colo.	74	61	13
Kansas City, Mo	77	67	10	Detroit, Mich	74	61	13
Denver, Colo	77	66	11	Philadelphia, Pa	73	55	18
Washington, D. C	74	69	5	Salt Lake City, Utah	72	58	14
Galveston, Tex	73	72	1	Chicago, Ill	71	58	13
Cleveland, Ohio	72	58	14	Vicksburg, Miss	69	65	4
Bismarck, N. Dak	71	67	4	Portland, Me	68	33	35
Savannah, Ga	64	56	8	Wilmington, N. C.	66	60	6
San Diego, Cal	64	74	—10	New Haven, Conn	65	48	17
San Francisco, Cal	62	56	6	Buffalo, N. Y	64	52	12
Helena, Mont	48	45	3	Boston, Mass	62	40	22
Portland, Oreg	35	31	4	Key West, Fla	61	33	28
Eastport, Me	31	29	2	New Orleans, La	58	59	— 1
				New York, N. Y	58	51	7
				Rochester, N. Y	50	51	— 1
				Baltimore, Md	.....	66	.....
				Des Moines, Iowa	.....	68	.....

NOTES BY THE EDITOR.

RECORD OF AURORAS AT WILLETS POINT, N. Y.

A record of the display of the aurora was maintained from February, 1870, to December, 1885, by the battalion of engineers at Willets Point, New York Harbor (lat. 40° 47′ 21″ N., long. 4h. 55m. 7s. W.). Three sentinel posts were guarded nightly by soldiers of the battalion, who remained on duty from sunset to sunrise, and each was required to report whether he had seen any auroral light during the night, and also whether the sky had been sufficiently clear to permit any aurora to be visible. The average of the reports of these